Estimates of Navy Ship Traffic in Puget Sound and Adjacent Coastal Waters

Jonathon Mintz
Ronald Filadelfo

March 22, 2004

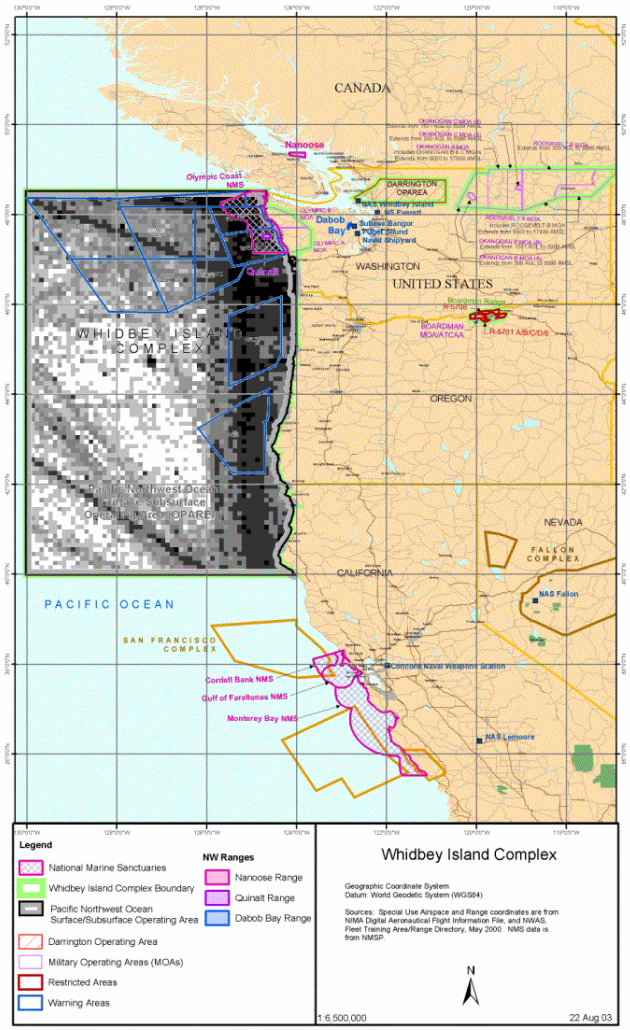
Introduction

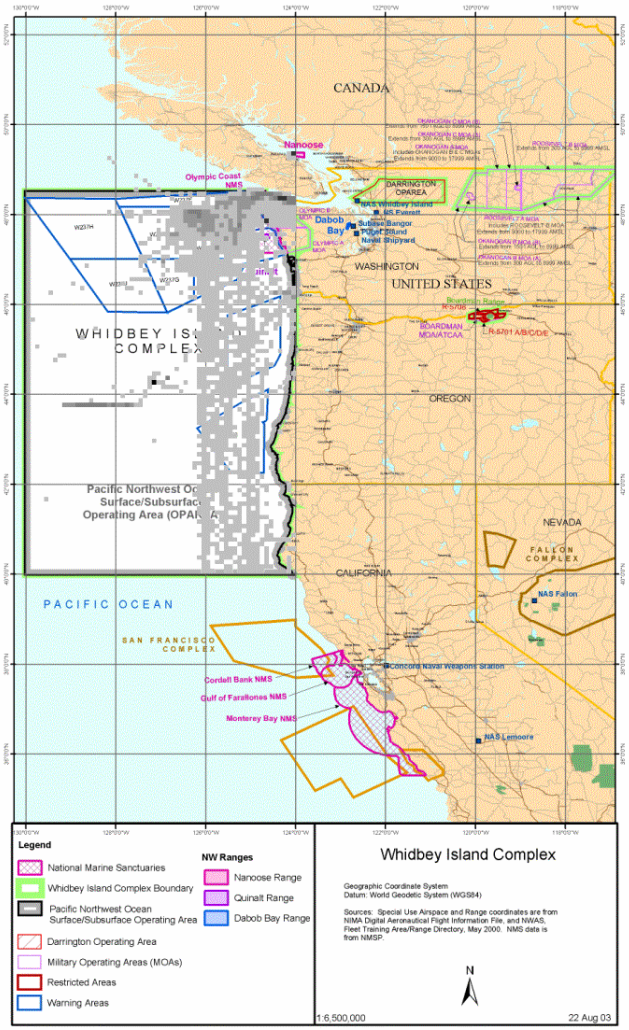
- Specific questions we'll look at:
  - What fraction of coastal ship traffic do Navy ships account for?
  - How do radiated noise levels of Navy ships compare to those of other ships?
- Outline
  - Offshore transit area
    - → Vessel tracks
    - → Ship-hours
    - → Radiated noise
  - Puget Sound
    - → Ship hours
    - → *Radiated noise*
  - Summary

Overview

Merchant/Fishing (left) and US Navy (right)

DRAFT

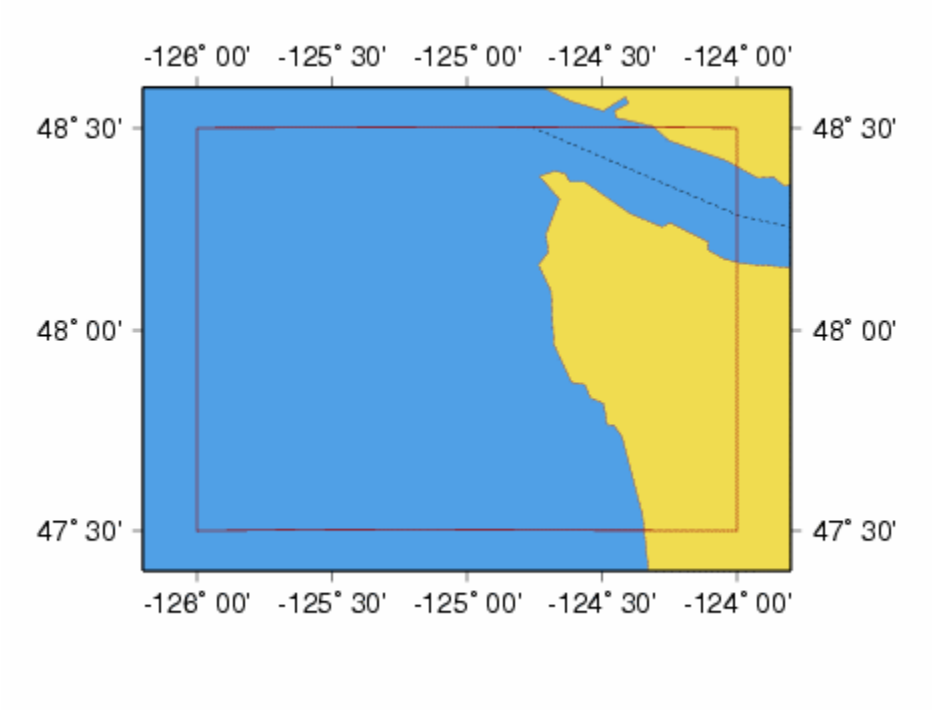




DRAFT

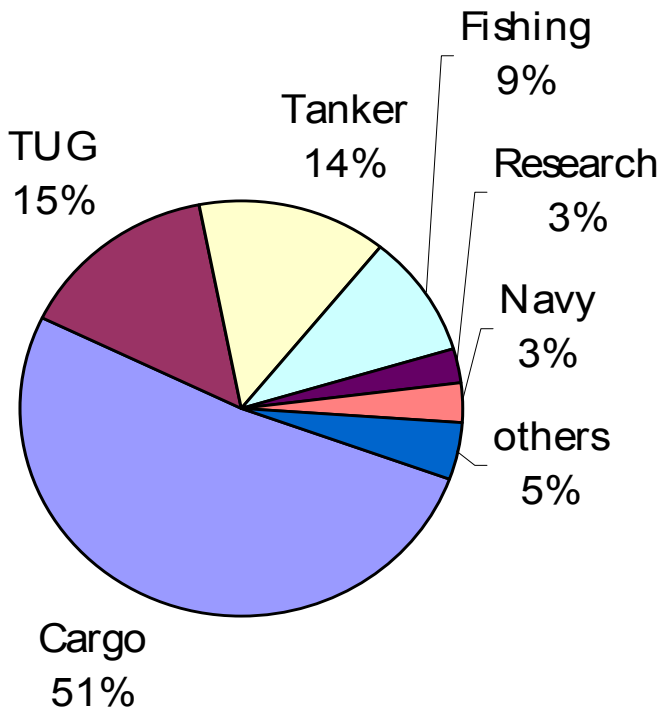
Took a closer look at a "transit-only" area

DRAFT



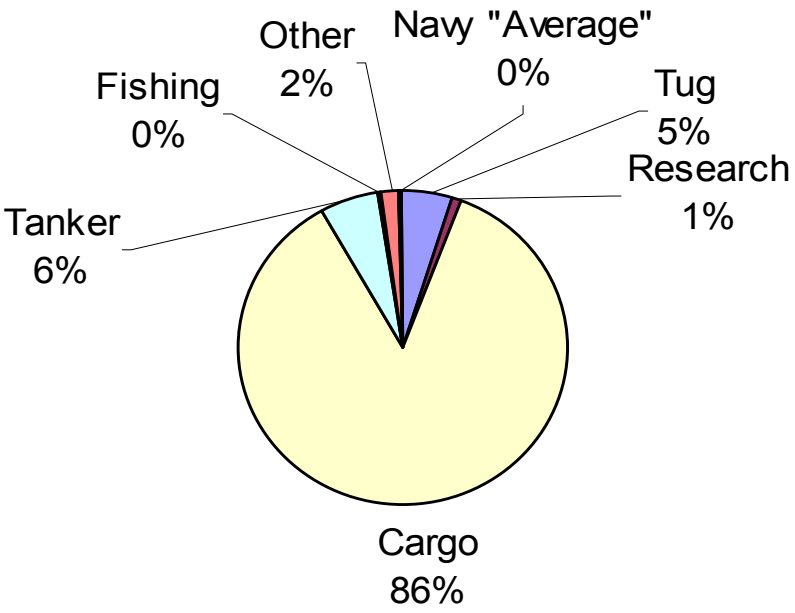
DRAFT

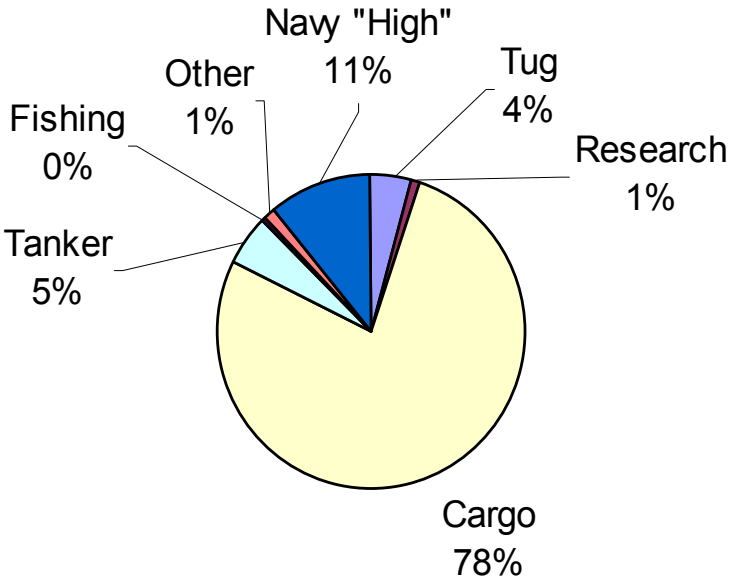
Ship hours in 2002 (in transit area)



Vessel radiated noise

DRAFT



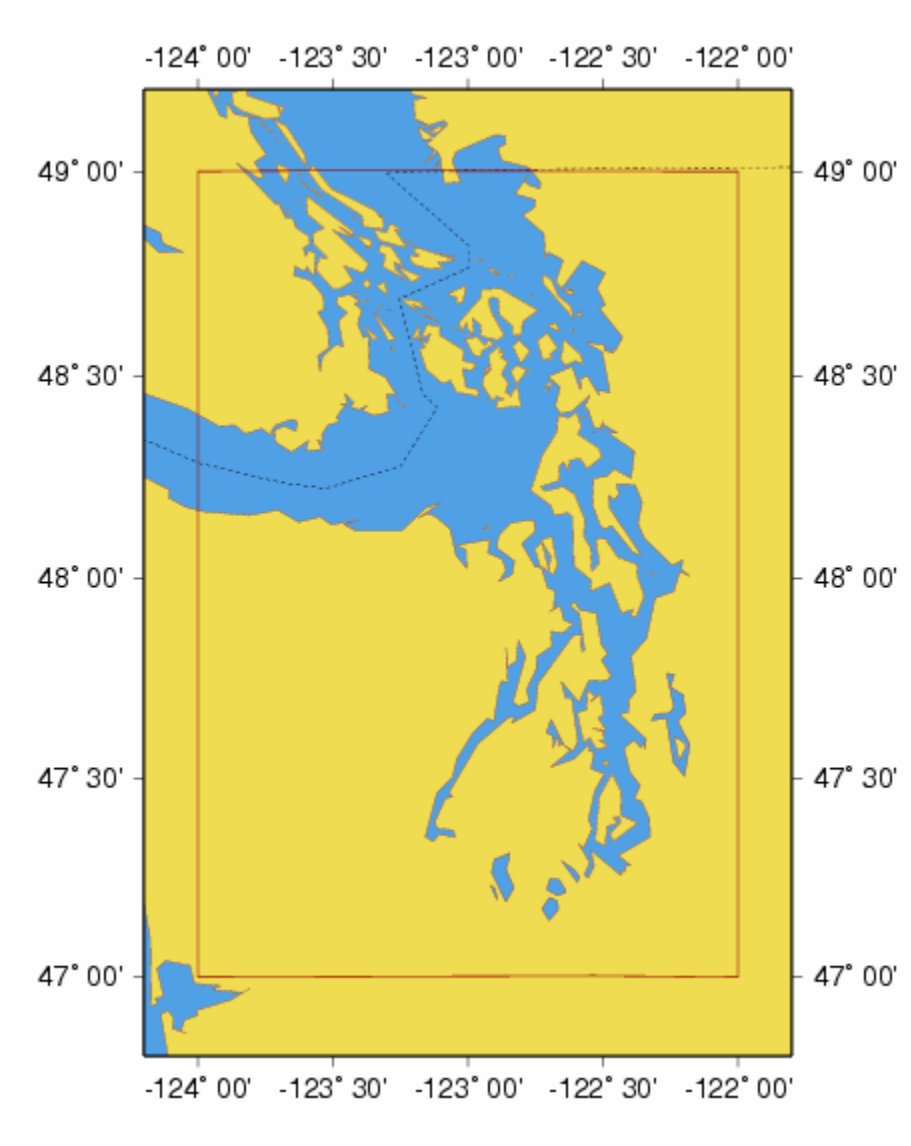


1/3 octave band at 70 hz

DRAFT

Puget Sound

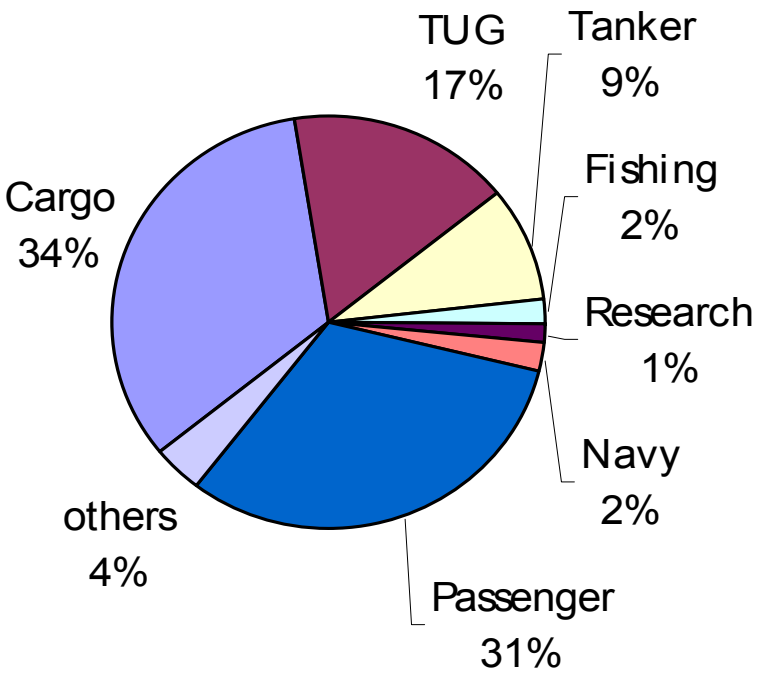
DRAFT



DRAFT

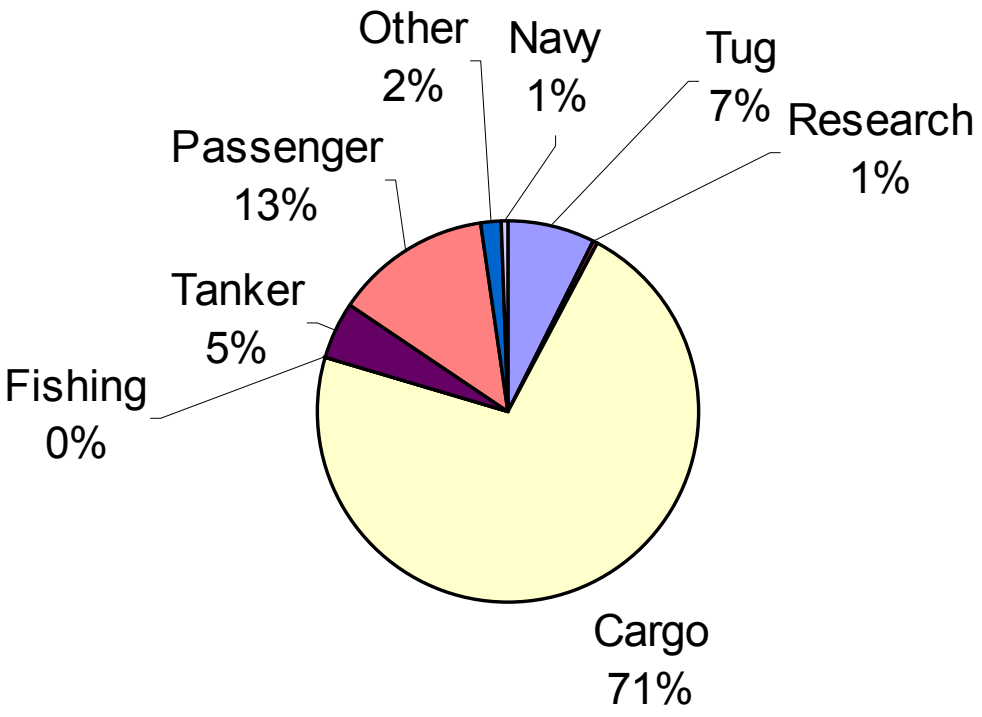
Overall ship hours 2002 (in Puget Sound)

DRAFT



DRAFT

Vessel Radiated Noise, Puget Sound



1/3 octave band at 70 hz

DRAFT

Summary

- "*On average*", Navy ships account for a small fraction of the coastal ship traffic
- Fundamental differences in distributions
  - Navy traffic is high patchy, in space and time
  - Commercial traffic is more uniform
- Major Navy activities (exercise, BG movements) produce vessel densities roughly ½ of the commercial background
- "*On average*", Navy ships account for a small fraction of the ship-generated low frequency broadband acoustic energy in the coastal ocean
  - Even large concentrations of Navy ships emit less acoustic energy than the commercial background
  - Scoping-level calculations!
- Data presented here does not include recreational vessel traffic
  - *Data on recreational vessels extremely limited*
    - ➔ *Radiated noise data virtually non-existent*

Back-up information

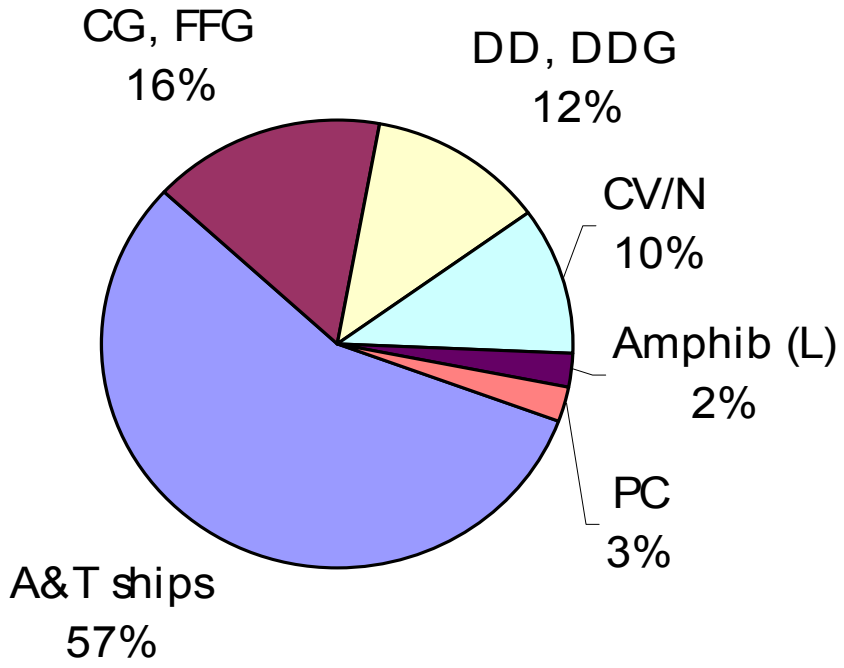
Appendix: Sample radiated noise calculations

TYPE	Number Present	70 HZ signature	erg/cm^2/sec per ship	watts per ship	total watts
CGO	12.76	173[a]	133.08	1.40	17.84
BLK	6.47	173[a]	133.08	1.40	9.05
TUG	9.70	166[d]	26.55	0.28	2.71
TKR	4.98	167[b]	33.43	0.35	1.75
FSH	1.22	157[c]	3.34	0.04	0.04
RES	0.73	166[d]	26.55	0.28	0.20
SVC	0.84	166[d]	26.55	0.28	0.24
PAS	17.94	166[d]	26.55	0.28	5.00
SPA	0.00	166[d]	26.55	0.28	0.00
FAC	0.07	166[d]	26.55	0.28	0.02
MIS	0.74	166[d]	26.55	0.28	0.21
TRN	0.03	166[d]	26.55	0.28	0.01
ICE	0.33	166[d]	26.55	0.28	0.09
REF	0.04	166[d]	26.55	0.28	0.01
YMT	0.03	166[d]	26.55	0.28	0.01

a. Urick 1983, figure 10.15; Used "freighter" curve, and made frequency and bandwidth corrections
b. Urick 1983, figure 10.15; Extrapolated speed up from 14 to 15 kt; made frequency correction by extrapolating the curve for "normal speeds and loading" down to 70 hz by fitting a line with EXCEL; added 12 db to convert to band level
c. Richardson 1995, figure 6.5a; used curve for trawler; Added 1 db to convert to ref. distance of 1 yd
d. Richardson 1995, figure 6.7; Used levels for "Support and Supply" ships (refers to ships of roughly 55-85 m); Took average, in intensity units, of 2 of the 3 ships shown (3rd looked to be outlier); added 35 db to convert from ref distance of 55 yd

Breakout of Navy traffic (in transit area)

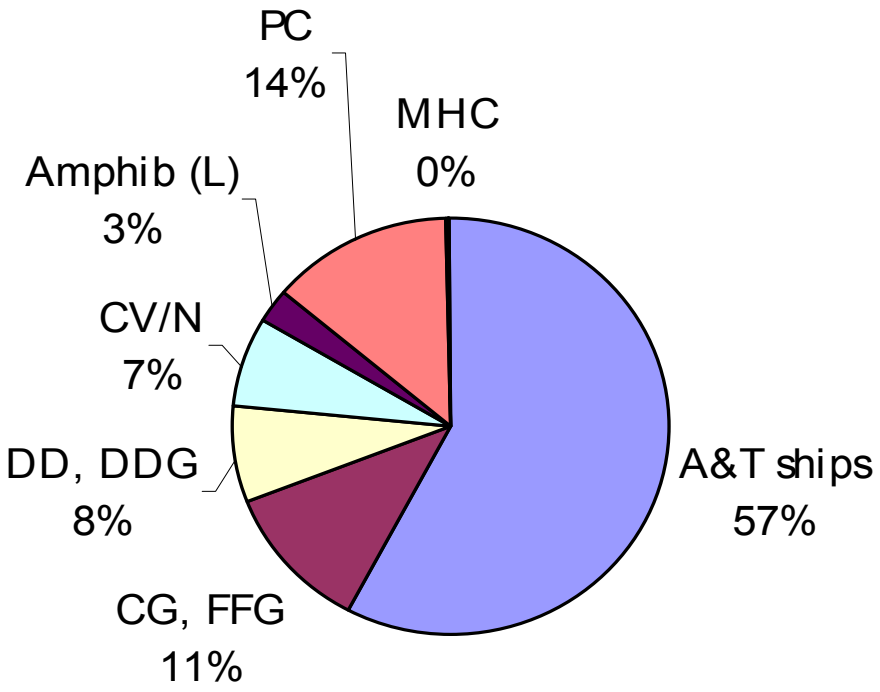
DRAFT



DRAFT

US Navy breakdown (in Puget Sound)

DRAFT



DRAFT